Draft
Fill Material Sampling Technical Memorandum

Libby Asbestos Project
Libby, Montana

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Prepared for:

ENVIRONMENTAL PROTECTION AGENCY
REGION 8

Prepared by:

U.S. Army Corps of Engineers
Omaha District
Rapid Response Program
Offutt AFB, Nebraska 68113

and

CDM FEDERAL PROGRAMS CORPORATION
555 17th Street
Suite 1100
Denver, Colorado 80212

DRAFT Fill Material Sampling Technical Memorandum
Libby Asbestos Superfund Site

1.0 Introduction

U.S. Army Corps of Engineers Rapid Response Program (USACE) is providing environmental engineering and remediation support to Region 8 of the U.S. Environmental Protection Agency (EPA) on the Libby Asbestos Superfund Project (Site). USACE support includes the preparation of technical documents, development of environmental plans (e.g., sampling and analysis, removal action, etc.), environmental assessments and investigations, and remediation activities. This sampling technical memorandum details the methodology and evaluation procedures for collecting and analyzing samples of fill material intended for use in restoration efforts associated with EPA response actions at the Site. Fill material samples will be collected by the project architectural and engineering (A&E) firm from fill material stockpiled at source pits, as designated by the project removal contractor (RC) responsible for procuring the fill material.

Current fill source types include topsoil, common fill, structural fill (3/4-inch crush), and "laydown" material specifically used for equipment staging and thoroughfare at response action properties. Other fill source types, referred to as landscape materials, that will be sampled but used at lower frequencies include sand, mulch/bark, and potting soil. This sampling memorandum will be used to guide the collection and analysis of samples from additional fill source types as they are identified.

All potential project fill sources will be visually inspected and/or sampled for Libby amphibole asbestos (LA) source materials (e.g., vermiculite). Fill sources that do not have a sufficient amount of fines (e.g., washed landscape rock) will be routinely inspected but not sampled. In addition to asbestos, fill sources will be sampled for various parameters depending on the intended use of the material, as discussed in Section 2.2. Common and structural fill sources will be routinely tested for compaction to ensure they are suitably dense for project restoration purposes.

Once fill material sample results are available, they will be evaluated against project-approved specifications. Approval notification will be submitted via email to the USACE and RC indicating that fill material results meet acceptance criteria. This process is discussed further in Section 4.0.

1.1 Background

The Site has been subdivided into eight operable units (OUs) to facilitate a phased approach to cleanup: 1) former W.R. Grace and Company (Grace) export plant area; 2) former Grace screening plant area; 3) former vermiculite mine area; 4) properties in and around the City of Libby not associated with former Grace operations; 5) former Stimson Lumber Company property; 6) Burlington Northern Santa Fe Railroad property; 7) properties in and around the town of Troy, Montana; and 8) U.S. and State highways. Since 2001, EPA has been performing

response actions at properties within several of these OUs to remove media contaminated with LA (i.e., soil, insulation, and interior dust). The objective of fill material sampling is to collect data of sufficient quality and representativeness to ensure fill material to be used in response actions is acceptably free of LA and other contaminants (as defined later) using EPA Libby project-specific and nationally-accepted analytical methods.

1.2 Schedule

Based on data collected during EPA's contaminant screening study, approximately 1,600 OU4 properties require a response action as a result of LA contamination. An estimated 700 properties in OU4 have had no previous investigation completed. OU7 properties requiring a response action were identified during the Troy Asbestos Property Evaluation conducted by the State of Montana (State). Response actions could include interior removal, exterior removal, or both. Currently, approximately 1,500 Libby properties, and several in Troy, have undergone response actions that meet cleanup goals as defined in EPA's *Action Level/Clearance Criteria Technical Memorandum* (EPA 2003). The overall schedule for implementing cleanups will be determined by annual EPA clean-up goals.

2.0 Sampling Program

2.1 Pre-Sampling Activities

2.1.1 Orientation

At the onset of each response action field season, a field planning meeting and any required trainings will be conducted by the A&E to ensure that field and support staff (e.g., sample coordination staff) understand and are able to carry out the requirements of this sampling memorandum. Additional field planning meetings will be held as needed to orient new field staff or discuss overall quality issues.

In general, sampling staff must be familiar with Site- and task-specific health and safety protocols, as discussed in the *Comprehensive Accident Prevention Plan* (CAPP) (CDM 2011), and possess current Occupational Safety and Health Administration (OSHA) certification and medical clearance for Hazardous Waste Operations and Emergency Response. Sampling staff must also complete asbestos awareness training, as required by OSHA 29 CFR 1910.1001. Sampling staff should exercise extreme caution when sampling fill materials as most of the stockpile sources are at or near live quarry operations.

2.1.2 Sampling Equipment and Supplies

The equipment and supplies listed below are required for fill material sampling. Any equipment/supplies not available in field inventory will be procured prior to sampling.

- Field logbook
- Indelible ink pen
- Digital camera
- Sampling trowel
- Measuring wheel
- Tarp or durable polyethylene sheeting
- Sampling containers (5-gallon buckets, zip-top bags, EnCore® containers, glass containers)
- Alconox detergent
- Locally-available distilled water
- American Society for Testing and Materials (ASTM) Type 2 (analyte-free) water
- pH meter with appropriate electrodes and calibration solution
- Disposable cups (approx. 3 oz.)
- Soil field sample data sheets (FSDSs)

- Sample and Location ID labels
- Custody seals
- Plastic zip-top bags (approximately gallon-size)
- PPE as required by the CAPP

2.2 Sampling Locations and Frequencies

Fill source locations will be established by the RC at the beginning of each response action field season. These locations will be communicated to the A&E contractor, who is responsible for collecting field samples and evaluating results. The following table illustrates the anticipated sampling frequency for each type of material sampled.

	Visual Inspection/Sampling Frequency per Cubic Yards of Material Used					
Source Material	**Visual Inspection**	**Asbestos**	**Agronomy**	**Geotechnical**	**Environmental Suite**	**Proctor**
Topsoil	All piles	All piles	3,000	NA	6,000	NA
Common Fill	All piles	All piles	NA	3,000	6,000	Various[3]
Structural (3/4-inch crush)	All piles	All piles	NA	3,000	NA	Various[3]
Laydown material	All piles	All piles	NA	NA	NA	NA
Landscape materials[1]	All piles	All piles[2]	NA	NA	NA	NA
Washed Rock/Gravel	All piles	NA	NA	NA	NA	NA

NA – not applicable

[1]Landscape materials include sand, landscape rock, bark/mulch, potting soil, etc.

[2]Only if materials contain sufficient amount of fines for sampling.

[3]Proctors will be collected on common and structural fill at the beginning of the construction season and at the time new fill source areas (e.g., different source pit) are identified.

Samples may be collected at a higher frequency (i.e., less material used) but never at a lower frequency unless approved by the EPA and/or USACE. In order to maximize sampling efficiency, stockpiles smaller than approximately 1,000 cubic yards (yd^3) will not be sampled unless directed by EPA and/or USACE. Field samples will be collected at a frequency commensurate with estimated usage rates for each type of fill material, as determined by the RC. Prior to construction activities, the RC and A&E contractor will develop a sampling schedule incorporating the estimated usage rates and sampling frequencies as shown in the table above. A planning spreadsheet will be developed with this information and populated as the season progresses. Overall fill material sampling frequencies may be adjusted in consultation with EPA and/or USACE.

2.3 Sample Collection

It is anticipated that most fill materials will be sampled directly from a stockpiled source. The RC will provide the A&E contractor with a list of vendors and point of contacts (POCs) for coordinating sampling events. Each fill material source supplier will have specific requirements for stockpiling material for sampling depending on the contract requirements. Samples will not be collected if discrete piles are not properly prepared and clearly marked by the supplier as indicated in the fill material request for quotations (RFQ) or scope of services (SOS) . Therefore,

coordination between the RC, A&E contractor, and suppliers is crucial so as to not disrupt the sampling process.

One 30-point composite sample will be collected from each stockpile source and reduced for sampling. From this composite sample, individual containers (e.g., zip-top bags, glass containers, etc.) will be filled per parameters sampled for. It should be noted that not every parameter is sampled for each source material. The general process is outlined below.

2.3.1 Stockpile Sampling

Prior to sampling, the volume of each stockpile sampled will be estimated and noted in the field logbook. The stockpile will be sampled utilizing guidelines described in American Society for Testing and Materials (ASTM) D 75-03, *Standard Practice for Sampling Aggregates* (ASTM 2003a) (Attachment 1) and in accordance with CDM-LIBBY-05, Revision 2, *Site-specific Sampling Guidance for Soil Sample Collection at Residential and Commercial Properties* (Attachment 1), with the following modifications:

- **Section 3 – Equipment:** Sample equipment is listed in Section 2.1.2 of this document.

- **Section 4 – Sampling Approach**: Samplers will not identify parcels nor designate use areas or zones requiring sampling; rather, samplers will collect samples from fill sources (typically stockpiles) that have been previously designated by the supplier. The stockpile will be segregated into thirds – top, middle, and bottom – for sampling purposes. A minimum of 30 individual subsamples will be collected, if practicable; 10 from each third of the stockpile. Samples will be collected from a minimum of 6 inches beneath the stockpile surface. Enough sample volume should be collected to fill a 5-gallon bucket.

- **Section 5 – Sample Collection**: Each fill material sample will be a composite sample comprised of a minimum of 30 individual subsamples collected from locations over the stockpile. Ideally, 10 aliquots will be collected from each third of the stockpile; top, middle, and bottom. However, safety considerations may limit access to the top third of the stockpile. Each aliquot will be inspected for visible vermiculite in accordance with CDM-LIBBY-06, Revision 1, *Semi-Quantitative Visual Estimation of Vermiculite in Soils at Residential and Commercial Properties* (Attachment 1) and the visible vermiculite observation recorded in the "Visible Vermiculite" section of the FSDS. *If vermiculite is observed in any fill source, sampling will be halted and the USACE onsite representative and the RC will be notified.* Soil will not be wetted with water before collection. In order to ensure that sufficient sample volume is collected for each parameter, an entire 5-gallon bucket will be filled. The sample will not be homogenized while still in the bucket.

Once the 5-gallon bucket of material (primary sample) is collected, the material volume will be homogenized and reduced for appropriate parameter sampling by quartering (Method B) as described in ASTM C702-98, *Standard Practice for Reducing Samples for Aggregate to Testing Size* (ASTM 2003b) (Attachment 1).

Once the primary sample has been reduced into quarters, collection of samples in accordance with analyte container requirements will commence. Samples will be collected for asbestos, agronomy, geotechnical, environmental suite, and Proctor testing at the frequencies listed in Section 2.2.

2.3.1.1. Asbestos Samples

Samples for asbestos will be collected from every fill material stockpile anticipated for use. The sample will be collected directly from one of the four quartered piles as described above. A zip-top plastic bag will be filled approximately 1/3 full (approximately 2,000 grams [g]).

2.3.1.2. Agronomy Samples

Samples for agronomy parameters will be collected from topsoil sources only. The sample will be collected directly from one of the four quartered piles as described above. A zip-top plastic bag will be filled approximately 3/4 full (approximately 2,500 g). Prior to sampling, the pH of the topsoil source will be measured using the following paste pH procedure (McLean 1982):

- Calibrate the pH meter over the appropriate range using the standard buffers. Do not return standard solution back to stock.
- Scoop approximately 5 g of soil into a paper cup.
- Add 5 milliliters (mL) of distilled or deionized water to the sample.
- Stir vigorously for 15 seconds and let stand for 30 minutes.
- Place electrodes in the slurry, swirl carefully, and read the pH immediately. Ensure the electrode tips are in the slurry and not in the overlying solution.
- Rinse electrode return to protective cap.

2.3.1.3. Geotechnical Samples

Samples for geotechnical parameters will be collected from common fill and structural fill sources only. The sample will be collected directly from one of the four quartered piles as described above. A zip-top plastic bag will be filled approximately 3/4 full (approximately 2,500 g).

2.3.1.4 Environmental Suite Samples

Samples for environmental suite parameters will be collected from topsoil and common fill sources only. Depending on turn-around time requirements, analytical suite testing may be provided by either EPA-approved CLP or A&E-contracted laboratories. Container types and quantities for analytical suite sampling are defined in *EPA's Contract Laboratory Program (CLP)*

Guidance for Field Samplers (EPA 2010) for samples analyzed by CLP laboratories; containers will be provided by the laboratory for samples analyzed by A&E-contracted laboratories.

Fill material soil samples for analytical parameters will be collected in accordance with CDM SOP 1-3, Surface Soil Sampling (Attachment 1), with the following clarifications and modifications:

- **Section 2.3 – Discussion and Section 5.2.1 – Method for Collecting Samples for Volatile Organic Compound (VOC) Analysis**: for samples being sent to A&E-contracted laboratories, the procedures stated in Section 5.2.1 will be followed to fill the required number of containers (provided by the laboratory). For samples being sent to CLP laboratories, VOC sampling will utilize self-contained EnCore sampling equipment in accordance with manufacturer's instructions and as described in Section 5.2.2.3 of CDM SOP 1-3.

- **Section 5.2.2 – VOC Field Sampling/Preservation Methods**: fill material sampling will employ low-level analyses (≤200 micrograms per kilograms). Container quantities and preservatives required for low-level analyses are specified by CLP Guidance (EPA 2010) or by the A&E-contracted laboratory for samples analyzed by CLP or non-CLP laboratories, respectively. As such, Sections 5.2.2.2, 5.2.2.3, and 5.2.2.4 of the SOP are not applicable.

- **Section 5.2.3 – Method for Collecting Samples for Nonvolatile Organic or Inorganic Compound Analysis**: metals, pesticide, and aroclor sampling will utilize decontaminated sampling trowels. Soil will be placed directly into the appropriate glass container using the aforementioned trowels. Homogenization of subsamples using stainless steel or Teflon-lined trays or bowls will not be required.

Although not directly addressed in CDM Sop 1-3, semi-volatile organic compound sampling will utilize decontaminated sampling trowels. Soil will be placed directly into the appropriate glass container using the aforementioned trowels.

2.3. Proctor Samples

Proctor samples will be collected from common fill and structural fill sources only. Unlike other parameters, Proctor samples will be collected separately (i.e., not reduced). Proctor samples will be collected from the stockpile similar to the procedure described in Section 2.3.1. However, because the Proctor method requires approximately one 5-gallon bucket of material, the sample will not be quartered and reduced. Following sample collection, the bucket will be secured with a fitted lid.

2.4 General Processes

This section describes the general field processes that will be used to support the sampling described in this sampling memorandum and includes references to CDM SOPs and investigation-specific modifications to established project procedures when applicable.

Unless expressly noted in subsequent sections, the processes listed in Table 2-1 will be followed during fill material sample collection, handling, and custody.

Table 2-1 Standard Operating Procedures (SOPs)

SOP Number	Current Revision Number	Title	Revision Date
CDM SOP 1-2	5	Sample Custody	March 2007
CDM SOP 1-3	6	Surface Soil Sampling	March 2007
CDM SOP 2-1	3	Packaging and Shipping of Environmental Samples	March 2007
CDM SOP 2-2	5	Guide to Handling Investigation-Derived Waste	March 2007
CDM SOP 4-1	6	Field Logbook Content and Control	March 2007
CDM SOP 4-2	7	Photographic Documentation of Field Activities	March 2007
CDM SOP 4-5	7	Field Equipment Decontamination at Nonradioactive Sites	March 2007
CDM-LIBBY-05	2	Soil Sample Collection at Residential and Commercial Properties	May 2007
CDM-LIBBY-06	1	Semi-Quantitative Visual Estimation of Vermiculite in Soils at Residential and Commercial Properties	May 2007
CDM-LIBBY-09	2	Global Positioning System (GPS) Coordinate Collection and File Transfer Process	July 2009

2.4.1 Sample Labeling and Identification

2.4.1.1 Non-Environmental Suite Samples

Non-environmental suite samples include asbestos, agronomy, geotechnical, and Proctor parameters. These samples will be labeled with sample identification numbers (IDs). For each sample collected, both the inner and outer soil sample bags (if applicable) and 5-gallon bucket (if applicable) will be labeled with a unique sample ID.

Fill material sample IDs will have the following format:

FM-#####

where:

FM = Fill material

= A unique, sequential five-digit number

2.4.1.2 Environmental Suite Samples

Environmental suite samples to be analyzed by a non-CLP laboratory will be labeled in accordance with the requirements listed in Section 2.4.1.1.

Environmental suite samples to be analyzed by CLP laboratories will be labeled in accordance with CLP Guidance (EPA 2010). In summary, sample IDs are assigned by EPA's CLP Laboratory Case Manager once a request for analytical services (RAS) has been processed. The CLP sample IDs will be correlated to the asbestos sample IDs from the same sampling location via field comments on the FSDS.

2.4.2 Field Logbooks

Field logbooks will be maintained in accordance with CDM SOP 4-1, Field Logbook Content and Control (Attachment A). The log is an accounting of sampling and will duly note problems or deviations from this sampling memorandum, as well as observations that may impact sample data. Notations on the following will be recorded daily:

- Project name
- Date
- Author
- Title of guidance document (this sampling memorandum)
- Property address
- Purpose
- Personnel onsite/site activities
- Weather
- PPE
- Specific sampling locations within property (e.g., Stockpile #1) and estimated volume of stockpile (if applicable)
- Sample IDs
- Time and to whom samples were relinquished

Field logbooks will be completed daily prior to leaving the site. As described in CDM SOP 4-1, logbook corrections will be completed with a single line strikeout, initial, and date. The correct information should be entered in close proximity to the erroneous entry.

Completed logbook entries specific to each fill material sampling event will be electronically scanned and maintained at the A&E office in Libby, Montana.

2.4.3 FSDS

FSDSs, which are used to record sample information, will be completed in accordance with EPA's project data reporting requirements. The FSDS number, located in the upper right-hand corner, should be recorded in the field logbook as a means to cross-reference sample information. FSDSs are used to directly enter information into the project database and to connect sample analysis results to the sample collected. An example copy of a soil FSDS is located in Attachment 1.

2.4.4 Photographic Documentation

Photographs will be taken at the discretion of sampling staff to document sampling locations, stockpile volume, site conditions/activities occurring during sampling activities, and at any other conditions that may impact sample data. Photographs will be taken with a digital camera in accordance with CDM SOP 4-2, Photographic Documentation of Field Activities (Attachment 1). Digital photographs will be maintained electronically at the A&E's office in Libby. Lognotes will not be used to describe the photographs, nor will photographic logs be maintained.

Photograph file names will have the following format:

Address_Sublocation_Date

Where:

Address = the address of the fill source visited

Sublocation = the sublocation within the property where the sample was collected (e.g., stockpile #1)

The date will be formatted as MM-DD-YY.

2.4.5 Coordinate Data

Global positioning system (GPS) coordinates will be collected in accordance with CDM-LIBBY-09, *GPS Coordinate Collection and Handling* (Attachment 1). GPS coordinates will be collected at locations that have not been previously sampled (i.e., new stockpiles). Coordinates will generally represent the sampled area, and are not be required to be offset.

To ensure proper GPS data collection, the following criteria have been established:

- The operator of the GPS unit must be standing at the sample location before the data collection begins.
- Once the unit begins logging data, the operator must remain standing at the sample location until the minimum required data points (30) have been collected.
- GPS collection is completed when the position dilution of precision (PDOP) is less than 4.5.

2.4.6 Equipment Decontamination

Decontamination of soil sampling equipment will be conducted in accordance with CDM SOP 4-5, *Field Equipment Decontamination at Non-Radioactive Sites* (Attachment 1), with the following exceptions:

Section 4.0, Required Equipment - Plastic sheeting will not be used during decontamination procedures. ASTM Type 2 water will be used for decontaminating equipment used during environmental suite sampling; however, for all other sampling, locally available de-ionized water may be used.

Section 5.0, Procedures - Decontamination water will not be captured and will be discharged to the ground at respective sampling locations.

Section 5.3, Sampling Equipment Decontamination – Sampling equipment that has been decontaminated will not be wrapped in plastic sheeting or aluminum foil. As stated in CDM SOP 4-5, Section 5.0, all equipment will be decontaminated before and after use.

Section 5.6, Waste Disposal - Decontamination water will not be captured and will not be packaged, labeled, or stored as investigation derived waste (IDW). Decontamination water will be discharged to the ground at respective sampling locations.

Materials used in the decontamination process will be disposed of as IDW as described in the next section.

2.4.7 Handling IDW

Any disposable equipment or other IDW will be handled in accordance with CDM SOP 2-2, *Guide to Handling of IDW* (Attachment A), with the following modification:

Section 5.2, Offsite Disposal – All IDW (not including excess soil volume) will be collected in transparent garbage bags and marked "IDW" with an indelible ink marker. These bags will be deposited into the asbestos-contaminated waste stream for appropriate disposal at the local landfill. Excess soil volume will be returned to the use area from where it was collected.

2.4.8 Field Sample Custody

Sample custody will follow the requirements specified in CDM SOP 1-2, *Sample Custody* (Attachment 1), with the following clarifications:

5.1 Transfer of Custody and Shipment –

- A chain of custody (COC) record will not be completed in the field. Initial sample custody will be documented through the collection of sample information using FSDS, along with a physical sample.

- Sample labels/tags will be limited to a unique sample ID, which will be clearly indicated using pre-printed labels or hand-written on both the inner and outer zip-top bag for soil samples as described in Section 2.4.1.

- Sampling teams will securely place a custody seal on individual asbestos, agronomy, geotechnical, and Proctor sample containers; however, for environmental suite samples, only the sample cooler and bag lining the cooler will be custody sealed.

All teams will ensure that samples, while in their possession, are maintained in a secure manner to prevent tampering, damage, or loss. Sample teams will then relinquish samples and supporting documentation (i.e., FSDS) to the A&E sample coordinator/broker for packaging and shipping preparation as discussed in Section 2.4.10.

2.4.9 COC Records

For the Libby project, the COC record is employed as physical evidence of sample custody and condition to the receiving facility. A completed COC record is required to accompany each batch of samples, whether it is hand-delivered to the EPA laboratory coordinator (LC) or shipped to a processing or analytical facility. The A&E's sample coordinator/broker will produce COC records in accordance with project-specific procedures for electronic COCs. Only quality-checked sample information will be used for COC records. In the event that electronic systems are unavailable (e.g., due to power outage or equipment failure), hard copy COC records will be employed. Any hard copy COC records will be data-entered as soon as electronic systems are available.

For hand-deliveries, the sample coordinator/broker will relinquish samples and corresponding COC records to the EPA LC under strict custody. During relinquishment, the sample coordinator will complete the following information in the designated spaces at the bottom of

the COC record: signature, company name, date, and time. The EPA LC will also complete the required information and will make a note regarding sample condition (e.g., OK – accept). The sample coordinator/broker will retain the bottom copy of the COC record for the project record.

An approved summary sheet specifying the asbestos preparation and analytical requirements for fill material samples will be attached to the COC record for all samples submitted for asbestos analysis. The summary sheet will be distributed by EPA, and reviewed and approved by all participating laboratories prior to any sample handling. The summary sheet (unapproved) specific to fill material asbestos samples is provided as Attachment 1.

2.4.10 Sample Packaging and Shipping

Samples will be packaged and shipped in accordance with CDM SOP 2-1, *Packaging and Shipping of Environmental Samples* (Attachment 1), with the following modifications:

1.3 Required Equipment – Vermiculite (or other absorbent material) will not be used for packaging or shipping samples.

1.4 Packaging Environmental Samples – No vermiculite or other absorbent material will be used to pack the samples. Ice will not be used to package asbestos samples and will be used for analytical samples only.

Samples will be hand-delivered to the EPA LC, picked up by a delivery service courier, or shipped by a delivery service to the designated facility or laboratory, as applicable. For hand-deliveries, the sample coordinator will package samples for transit such that they are contained and secure (i.e., will not be excessively jostled). Clean plastic totes with the lids secured or sample coolers may be used for this purpose.

For samples requiring shipment, prior to sealing the shipping container, the sample coordinator/broker will complete the following information in the designated spaces at the bottom of the COC record: signature, company name, date, and time. The sample coordinator/broker will retain the bottom copy of the COC record for the project record.

2.5 Field Quality Assurance/Quality Control

2.5.1 Field QC Samples

Based on the intended use of the data, no fill material field QC samples are required. However, for each environmental suite sampling event, one field sample will be designated as a matrix spike/matrix spike duplicate (MS/MSD) for use in laboratory QC. Field staff will collect the appropriate amount of additional sample volume, per the laboratory-specific requirements, to account for the MS/MSD.

2.5.2 Modification Documentation

All major deviations from this sampling memorandum or associated guidance documents will be recorded on a Libby Asbestos Project Record of Modification Form for Field Activities. Major deviations are defined as those impacting or having the potential to impact data quality. If the modification is intended to be permanent deviation, it will be discussed and approved by EPA and/or USACE prior to implementation. As field modifications to governing documents are

implemented, the author of the modification form will communicate the changes to appropriate staff.

2.5.3 Field Audits

Field audits are conducted to ensure that proper procedures are followed as required and that deviations from procedures are documented. One annual internal field audit is anticipated to be conducted for fill material sampling processes. Every attempt will be made to schedule and conduct the field audit in the first month of fill material sampling in order to identify and correct any deviations early in the construction season.

2.6 Field Data Reporting

Sample information collected in the field will be delivered to EPA in accordance with the current version of the *EPA Data Management Plan* (EPA 2010).

3.0 Processing and Analytical Requirements

This section discusses the analytical, custody and documentation, QA/QC, and data management requirements to be employed by processing facilities and laboratories (herein referred to as facilities) in support of fill material sampling.

EPA will be responsible for all asbestos analysis, including any sample processing prior to analysis, and all non-priority (10-day turnaround time) environmental suite analysis. The A&E contractor will be responsible for agronomy, geotechnical, priority (3-day turnaround time) environmental suite, and Proctor analysis via their contracted laboratory. For asbestos samples, the A&E contractor will be responsible for relinquishing samples to the EPA LC or appropriate facility. The A&E sample coordinator/broker will be responsible for communicating with the EPA LC or facility to relay information related to sample quantities, collection dates, and requested turnaround times.

3.1 Analytical Methods

The following sections describe the analytical methods for each parameter sampled.

3.1.1 Asbestos Samples

Fill material samples will be analyzed for asbestos using the current version of the polarized light microscopy visual estimation method (PLM-VE), SRC-LIBBY-03 (SRC 2003), and the polarized light microscopy gravimetric method (PLM-Grav), SRC-LIBBY-01 (SRC 2002). All EPA-approved laboratory modifications to these methods apply.

Prior to analysis, all fill material asbestos soil samples require processing using the current version of ISSI-LIBBY-01, *Soil Sample Preparation* (ISSI Consulting Group [ISSI] 2000) and the procedures included in the *Soil Preparation Work Plan* (TechLaw 2007). In brief, the raw soil sample will be split into two aliquots: one aliquot will be placed into archive and the other aliquot sieved into coarse (greater than 1/4-inch) and fine fractions. The coarse fraction will be analyzed for asbestos using PLM-Grav. The fine fraction will then be ground to reduce particles to a diameter of 250 microns (µm) or less. One aliquot of the fine-ground sample will be analyzed for asbestos using PLM-VE.

The A&E's sample coordinator will indicate the requested analysis (i.e., PLM-VE/PLM-Grav) in the analysis request section of the COC record or in an attachment to the COC record. It is the responsibility of the soil preparation facility, in turn, to specify the appropriate PLM method on their COC records to the analytical laboratory.

3.1.2 Agronomy Samples

Agronomy samples will be analyzed for the following parameters using the methods listed:

Table 3-1 Agronomy Parameter Requirements for Fill Material

Parameter	Method	Preservative	Holding Time
organic matter	LOI (ASTM D 2974) and Walkley-Black Method (ASA 29-3 Monograph 9, Part 2 (1982))	NA	NA
pH	ASA Monograph 9, Part 2 (1982), Method 10-3.2	NA	NA
electrical conductivity	ASA Monograph 9, Part 2 (1982), Method 10-3.3	NA	NA
sodium adsorption ratio (Calcium [Ca], Magnesium [Mg], Sodium [Na])	ASA Monograph 9, Part 2 (1982), Method 10-3.4, EPA 6010B	NA	NA
soil texture	ASA Monograph 9, Part 1 (1982), ASA 15-5	NA	NA
cation exchange capacity	ASA Monograph 9, Part 2 (1982), Method 8-3	NA	NA
plant available nitrogen	ASA Monograph 9, Part 2 (1982), Method 33-8.1	NA	NA
plant available phosphorus	ASA Monograph 9, Part 2 (1982), Method 24-5.4	NA	NA
plant available potassium	ASA Monograph 9, Part 2 (1982), Method 13-3.5	NA	NA

LOI – loss on ignition
ASTM – American Society for Testing Materials
ASA – American Society of Agronomy
NA – not applicable

3.1.3 Geotechnical Samples

Samples for geotechnical parameters will be collected from both common fill and structure fill sources. However, only a subset of geotechnical parameters will be analyzed for structural fill. The following table illustrates which geotechnical parameters will be analyzed per material:

Table 3-2 Geotechnical Parameter Requirements for Fill Material

Parameter	Material	Method	Preservative	Holding Time
gradation	common fill	ASTM D 422 (sieve sizes 2-inch, No. 4, 40, and 200)	NA	NA
	structural fill	ASTM D 422 (sieve sizes 1 1/2-inch, No. 4, and 200)		
soil classification	common fill	ASTM D 2487	NA	NA
pH	common fill	ASTM D 4972	NA	NA
moisture content, organic matter	common fill	ASTM D 2974	NA	NA
liquid limit, plastic limit, and plasticity index	common/structural fill	ASTM D 4318	NA	NA

ASTM – American Society for Testing Materials
NA – not applicable

3.1.4 Environmental Suite Samples

Analytical samples will be analyzed for the following parameters using the methods listed:

Table 3-3 Environmental Suite Requirements for Fill Material

Parameter	Method	Preservative	Holding Time
total metals	EPA 6010/6020 or CLP SOW ILM05.4	Ice to ±4°C	6 months
mercury	EPA 7471 or CLP SOW ILM05.4	Ice to ±4°C	28 days
volatile organic compounds	EPA 8260 or CLP SOW SOM01.2	Ice to ±4°C	48 hours*/ 14 days**
semi-volatile organic compounds	EPA 8270 or CLP SOW SOM01.2	Ice to ±4°C	14 days
pesticides	EPA 8081 or CLP SOW SOM01.2	Ice to ±4°C	14 days
aroclors	EPA 8082 or CLP SOW SOM01.2	Ice to ±4°C	14 days

*****samples must be frozen by the laboratory within 48 hours of receipt
**sample analysis must be performed within 14 days

The A&E sample coordinator/broker will indicate the requested analysis (i.e., environmental suite) in the analysis request section of the COC record, and the specific parameters will be listed in an attachment to the COC record.

3.1.5 Proctor Samples

Proctor samples will be analyzed in accordance with ASTM method D698-07, *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort* (ASTM 2007). The A&E's sample coordinator/broker will indicate this analysis in the analysis request section of the COC record.

3.2 Holding Times

No preservation requirements or holding times are required for asbestos, agronomy, geotechnical, or Proctor samples; however, soil samples submitted for asbestos analysis will be oven-dried prior to long-term storage to mitigate the potential for biological growth. Holding times for all samples are listed in Section 3.1.

3.3 Facility Custody Procedures

Custody procedures are provided in the respective QA management plans for each facility that processes or analyzes Libby samples. In general, upon receipt at the facility, each sample shipment will be inspected to assess the condition of the shipment and the individual samples. This inspection will include verifying sample integrity. The accompanying COC record will be cross-referenced with all of the samples in the shipment. The facility sample custodian will sign the COC record and maintain a copy for their project record. For laboratory work, the original COC record will be included in the hard copy data report. Next, the sample custodian may assign a unique laboratory number to each sample on receipt. This number will identify the sample through all further handling and reporting at the facility. It is the responsibility of each facility to maintain internal documentation throughout sample preparation, analysis, data reporting, and sample archiving.

3.4 Facility Quality Assurance/Quality Control (QA/QC)

Samples collected under this sampling memorandum will be analyzed in accordance with standard EPA and/or nationally-recognized analytical procedures (i.e., Good Laboratory Practices) in order to provide analytical data of known quality and consistency. Specific QA/QC procedures are provided in the respective QA management plan or facilities operations plan for each facility that processes or analyzes Site samples.

For project sample processing and asbestos analysis facilities, QA/QC includes maintaining appropriate and current certifications; team and analyst training and mentoring, as appropriate; analysis of facility QC samples; and facility audits. For agronomy parameters (Table 3-1), laboratories must be currently certified in the North American Proficiency Testing (NAPT) Program of the Soil Science Society of America. For geotechnical parameters (Table 3-2) and Proctor samples, laboratories must be currently certified by either the American Association of State Highway and Transportation Officials (AASHTO) – AASHTO Materials Reference Laboratory (AMRL) or USACE Materials Testing Center (MTC) Laboratory Validation for each parameter listed.

3.4.1 Facility QC Samples

3.4.1.1 Asbestos Samples

Facilities processing or analyzing fill material asbestos samples will comply with the QC requirements specified in:

- ISSI-LIBBY-01 and the *Soil Preparation Work Plan* (TechLaw 2007)
- Summary of Preparation and Analytical Requirements for Asbestos (attached)

3.4.1.2 Agronomy Samples

No QC samples are required for fill material agronomy samples.

3.4.1.3 Geotechnical Samples

No QC samples are required for fill material geotechnical samples.

3.4.1.4 Analytical Samples

For each analytical parameter event (typically weekly or bi-weekly, depending upon the fill source/type), one fill material analytical sample will be designated as an MS/MSD for laboratory QC purposes.

3.4.1.5 Proctor Samples

No QC samples are required for fill material Proctor samples.

3.4.2 Modification Documentation

All major deviations from this sampling technical memorandum or associated guidance documents will be recorded on a Libby Asbestos Project Record of Modification Form specific to either processing facility or laboratory activities. Major deviations are defined as those impacting or having the potential to impact data quality. As processing facility or laboratory modifications to governing documents are implemented, the author of the modification form will communicate the changes to appropriate staff.

3.4.3 Facility Surveillances and Audits

Libby project facilities and independent laboratory may be observed or audited at any time by EPA or EPA-designated staff to ensure compliance with contract and project requirements.

3.5 Facility Nonconformance

For asbestos samples, Libby project facilities will immediately notify the EPA LC if major problems occur (e.g., catastrophic equipment failure). The EPA LC will then notify the A&E's sample coordinator/broker of potential impacts to turnaround times. Other nonconformance issues, such as those found during performance evaluations or audits, will be addressed on a case-by-case basis by the EPA's facility audit team.

For non-asbestos samples, laboratories will immediately notify the contracting party's point of contact (typically, the project manager) of any sample-related issues. The contracting party's point of contact will make every attempt to work with the laboratory to resolve issues, and will immediately notify the USACE field representative and RC project manager of any major issues impacting, or potentially impacting, the sample data quality or the schedule to complete sample analysis.

3.6 Facility Data Reporting

Sample processing and analytical data will be delivered to EPA in accordance with the current version of the *EPA Data Management Plan* (EPA 2010).

4.0 Results Notification

Prior to distributing results, qualified A&E staff will review the results of all parameters sampled and evaluate results according to project criteria. An email describing the type of fill material sampled and parameters measured, along with a brief discussion on whether the material meets specification will be submitted to the USACE field representatives and RC project manager. In cases where samples do not meet evaluation criteria as described below, the A&E contractor will notify the EPA Onsite RPM, USACE field representatives, and RC immediately via phone. Fill material sources that do not meet the evaluation criteria will be rejected unless otherwise directed by the EPA Onsite RPM or USACE field representative.

All analytical results will be maintained in the project database or A&E contractor project files. The following sections details how fill material results will be evaluated to ensure they meet project and material specification.

4.1 Evaluation Criteria

Fill material results will be evaluated according to project and material specifications. Some parameters are measured for informational and planning purposes only and will not be used as a pass/fail criterion for fill material.

4.1.1 Asbestos Samples

All fill materials used for restoration purposes will be free of detectable LA (i.e., analytical results are non-detect by both the PLM-VE and PLM-Grav methods).

4.1.2 Agronomy Samples

The following table illustrates acceptable topsoil criteria:

Table 4-1 Agronomy Parameters Evaluation Criteria

Parameter	Requirement
organic matter	3 to 10 percent
pH	6.0 to 7.5
electrical conductivity	<5 mmhos/cm
sodium adsorption ratio (Ca, Mg, Na)	<12 meq/L
soil texture	Loam, sandy loam, or sandy clay loam as defined by USDA soil triangle
cation exchange capacity	5 – 25 meq/100 grams
plant available nitrogen	Informational purposes only
plant available phosphorus	Informational purposes only
plant available potassium	Informational purposes only

mmhos/cm – milimhos per centimeter
meq/L – milliequivalent per liter
USDA – U.S. Department of Agriculture

4.1.3 Geotechnical Samples

Geotechnical samples will be collected from both common fill and structural fill sources. However, evaluation criteria are different for each type of material. The following sections describe the evaluation criteria and acceptable limits for both common fill and structural fill materials.

4.1.3.1 Common Fill

The following table lists acceptable common fill criteria:

Table 4-2 Geotechnical Parameters for Common Fill Evaluation Criteria

Parameter	Requirement	
gradation	2-inch	100% finer
	No. 4	50 to 90% finer
	No. 40	25 to 85% finer
	No. 200	15 to 40% finer
soil classification	Informational purposes only	
pH	6.0 to 8.0	
moisture content, organic matter	Informational purposes only	
liquid limit, plastic limit, and plasticity index	liquid limit less than 35 and plasticity index of less than 10	

% percent

4.1.3.2 Structural Fill

Although there are no specific requirements for structural fill gradation, the following table lists criteria to be used as guidance:

Table 4-3 Geotechnical Parameters for Structural Fill Evaluation Criteria

Parameter	Guidance	
gradation	11/2-inch	100% finer
	No. 4	25 to 55% finer
	No. 200	0 to 8% finer
liquid limit, plastic limit, and plasticity index	Liquid limit less than 35 and plasticity index of less than 10	

% percent

4.1.4 Environmental Suite Samples

Environmental suite samples will be compared to Montana Department of Environmental Quality (MDEQ) background concentrations for arsenic in soil (MDEQ 2005), as well as EPA Region 9 regional screening levels for residential soil (formerly, preliminary remediation goals). These screening levels can be found at: http://www.epa.gov/region9/superfund/prg/index.html.

4.1.5 Proctor Samples

Proctors results will be evaluated by the USACE onsite representatives and used by A&E staff to perform associated compaction testing at response action properties.

5.0 References

ASTM. 2003a. Method D 75-03, *Standard Practice for Sampling Aggregates*. July.

_____. 2003b. Method C 702-98, *Standard Practice for Reducing Samples of Aggregate to Testing Size*. July

_____. 2007. Method D698-07, *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort*. April.

CDM. 2011. *Comprehensive Accident Prevention Plan, Libby Asbestos Project, Libby, Montana*. May.

EPA. 2003. *Draft Final Libby Asbestos Site Residential/Commercial Cleanup Action Level and Clearance Criteria Technical Memorandum*. December 15. Amendment in review.

_____. 2010. *Contract Laboratory Program Guidance for Field Samplers*. OSWER 9240.0-47. EPA 540-R-09-03. May.

_____. 2010. Draft. EPA Data Management Work Plan. In draft.

ISSI. 2000. ISSI-LIBBY-01. *Soil Sample Preparation*, Revision 1 (original version). January 7. Revision 2 dated July 12, 2000. Revision 3 dated May 7, 2002. Revision 4 dated August 1, 2002. Revision 5 dated March 6, 2003. Revision 6 dated March 24, 2003. Revision 7 dated August 5, 2003. Revision 8 dated May 4, 2004. Revision 9 dated May 14, 2007. Revision 10 dated December 6, 2007.

McLean, E.O. 1982. *Soil pH and Lime Requirement*. *In* A.L. Page *et al.* (ed.) *Methods of Soil Analysis, Part 2*. Agronomy Monograph No. 9. Pages 199 – 224. American Society of Agronomy. Madison, WI.

MDEQ. 2005. *Action Level for Arsenic in Surface Soil*, Montana Department of Environmental Quality Remediation Division. April.

SRC. 2002. SRC-LIBBY-01. *Qualitative Estimation of Asbestos in Coarse Soil by Visual Examination Using Stereomicroscopy and Polarized Light Microscopy*. November 12. Revision 1 dated May 20, 2003. Revision 2 dated April 21, 2004.

_____ 2003a. SRC-LIBBY-03. *Analysis of Asbestos Fibers in Soil by Polarized Light Microscopy*. March 3. Revision 1 dated December 11, 2003. Revision 2 dated October 10, 2008.

TechLaw. 2007. *Soil Preparation Work Plan*. Libby Asbestos Site – Operable Unit 7. Revision D. March.

Attachment 1

Standard Operating Procedures

The following SOPs are not included within Attachment 1 of this document due to being confidential business information:

CDM SOP 1-2
CDM SOP 1-3
CDM SOP 2-1
CDM SOP 2-2
CDM SOP 4-1
CDM SOP 4-2
CDM SOP 4-5

Site-Specific Sampling Guidance
Libby Superfund Site

Guidance No.: CDM-LIBBY-05, Revision 2

Guidance Title: Soil Sample Collection at Residential and Commercial Properties

Approved by:

Technical Reviewer — Date: 5/10/07

QA Reviewer — Date: 5/10/07

Volpe Center Approval — Date: 05/10/07

EPA Approval — Date: 5/10/07

Section 1
Purpose

The goal of this standard operating procedure (SOP) is to provide a consistent method for the collection of 30-point composite surface soil sampling to support all investigations conducted at the Libby Superfund Site and specified in governing guidance documents. This SOP describes the equipment and operations used for sampling surface soils in residential and commercial areas, which will be submitted for the analysis of Libby amphibole asbestos. Refer to each investigation-specific guidance documents or work plan for detailed modifications to this SOP, where applicable. The EPA Team Leader or their designate must approve deviations from the procedures outlined in this document prior to initiation of the sampling activity.

Section 2
Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff with responsibility for the collection of soil samples is responsible for understanding and implementing the requirements contained herein as well as any other governing guidance documents.

Task Leader (TL) or Field Team Leader (FTL) - The TL or FTL is responsible for overseeing sample collection processes as described in EPA approved governing guidance documents (i.e., site-specific sampling and analysis plans [SAPs], quality assurance project plans [QAPPs], etc.). The TL or FTL is also responsible for checking all work performed and verifying that the work satisfies the specific tasks outlined by this SOP and all governing guidance documents. The TL or FTL will communicate with the field team members regarding the specific collection objectives and anticipated situations that require deviation from this SOP. It is also the responsibility of the TL or FTL to communicate the need for any deviations from the SOP with the appropriate EPA personnel (team leader or their designate), and document the deviations using a Field Modification Form provided in each SAP or QAPP.

Field team members - Field team members performing the sampling described in this SOP are responsible for adhering to the applicable tasks outlined in this procedure while collecting samples at properties associated with the Libby Superfund Site. The field team members should have limited discretion with regard to collection procedures but should exercise judgment regarding the exact location of sample points, within the boundaries outlined by the TL or FTL.

Section 3
Equipment

- Measuring tape or wheel – Used to estimate the square footage of each land use area.
- Pin flags – Used to identify composite points within each sampling area.
- Trowel or push probe - For collecting surface soil samples.
- Shovel - For collecting surface soil samples.
- Stainless steel mixing bowl - Used to mix and homogenize composite soil samples after collection. Zip-top bags may also be used for homogenization if approved by the governing guidance documents.
- Gloves - For personal protection and to prevent cross-contamination of samples (disposable, powderless plastic or latex).
- Sample container - Gallon-sized zip-top plastic bags (2 per sample).
- Field clothing and personal protective equipment (PPE) - As specified in the current version of the site health and safety plan (HASP).
- Field sprayers – Used to suppress dust during sample collection and to decontaminate nondisposable sampling equipment between samples.
- Deionized (DI) water- Used in field sprayers to suppress dust and to clean and decontaminate sampling equipment.
- Plastic bristle brush - Used to clean and decontaminate sampling equipment.
- Wipes - Disposable, paper. Used to clean and decontaminate sampling equipment.
- Aluminum foil – Used to wrap decontaminated sampling equipment in between uses to prevent contamination during transport.
- Alconox – Used to clean and decontaminate sampling equipment weekly.
- 6-mil poly bag – Used to store and dispose of investigation-derived waste (IDW).
- Trash bag - Used to store and dispose of general trash.
- Field logbook/PDA - Used to record progress of sampling effort and record any problems and field observations.

- Visual Vermiculite Estimation Form (VVEF) – Used to record semi-quantitative estimates of visual vermiculite at each sub-sample location and point inspection (PI).

- Permanent marking pen - Used to label sample containers.

- Sample ID Labels (Index IDs)– Pre-printed stickers used to label sample containers.

- Cooler or other rigid container - Used to store samples while in the field.

- Custody Seals - For ensuring integrity of samples while in the field and during shipping.

Section 4
Sampling Approach

Upon arrival at each property, the field team will locate all parcels requiring sample collection depending on the investigation-specific objectives detailed in governing guidance documents. Parcels on a property will be sectioned into zones that share a similar land use. Zones established by land use areas may be subdivided based on site conditions (e.g., access, construction setup considerations, etc.). Use areas include:

- Specific Use Area (SUA): flowerbed, garden, flowerpot, stockpile, play area, dog pen, driveway (non-paved), parking lot (non-paved), road (non-paved), alley (non-paved)

- Common Use Area (CUA): yard, former garden, former flowerbed, walkway

- Limited Use Area (LUA): pasture, maintained/mowed field, overgrown areas with trails/footpaths, overgrown areas in between SUAs/CUAs

- Interior Surface Area (ISA): soil floor of garage, pumphouse, shed, crawlspace, earthen basement

- Non-Use Areas(NUA): wooded lot, un-maintained field. NUAs will be identified but will not be sampled at this time because they are not presently considered a complete exposure pathway. However, to the extent that NUAs may become a complete exposure pathway in the future, EPA may revisit NUAs at a later date.

After areas have been designated as zones (i.e., SUA zones, CUA zones, LUA zones, NUA zones, ISA zones), the field team will measure the zones with a measuring wheel and label the zone type and approximate square footage on the field sketch and/or design drawings. There is not a minimum or maximum square footage restriction on any zone.

In establishing zones at the property, no area type may be combined with any other area type. For example, driveways and flowerbeds are both SUAs but will be

separated into unique zones for soil sampling. Similarly, large CUAs such as yards may be subdivided into front yard, side yard, and back yard zones dependent on site conditions. Sectioning properties into additional zones will be at the discretion of the FTL but consistent among the teams. Conversely, not all land use areas previously mentioned will be applicable at every property.

It is anticipated that SUAs and ISA zones will generally tend to be smaller parcels. Combining small, proximal SUAs into one zone will be at the discretion of the FTL but consistent among teams. With the exception of proximal SUAs, all other land use areas will be contiguous when establishing zones at each property.

Composite sampling requires soil collection from multiple (sub-sample) points. Composite samples will be collected from similar land use areas (i.e., SUA, CUA, etc.) and will not be combined with any other use area. One composite sample will be collected from each zone that does not contain visual vermiculite.

For SUAs (e.g., driveway, garden, dog pen, etc.), composite samples will be collected from the 0- to 6–inch depth interval. If a depth of 6 in. cannot be attained given the varying levels of compaction in driveways, roads, etc. the maximum depth attainable will be documented in the field logbook/PDA. For non-SUAs (e.g., yard, former flowerbed, crawlspace, etc.), composite samples will be collected from 0 to 3 inches. All composite soil samples will have 30 sub-samples (i.e., 30-point composite sample) of approximately equal size for a final sample volume between 2,000 and 2,500 grams. Table 1 lists the sample depth for each type of land use area.

Table 1 Sampling Area and Depth

Land Use Area	Label	Sampling Depth (Inches)
Special Use Area	SUA	0 – 6
Common Use Areas	CUA	0 – 3
Limited Use Area	LUA	0 – 3
Non-Use Area	NUA	Not Sampled
Interior Surface Zone	IS	0 – 3

As each sub-sample is collected, the soil will be inspected for visual vermiculite (VV) and the location and semi-quantitative estimates of VV will be recorded as prescribed in the SOP for Semi-Quantitative Visual Estimation of Vermiculite in Soil, Revision 1 (CDM 2007a).

Areas of SUAs with VV will not be sampled. Instead, the location will be recorded in the field logbook/PDA and on the field sketch or design drawing. If the SUA is of substantial size (greater than 1000 square feet [ft^2]), and the VV is localized, additional PIs will be collected to determine the extent of VV and a sample will be collected from the remainder of the zone that does not contain VV. If the SUA measures less than 1,000 ft^2 and VV is present, a sample will not be collected from that SUA. Proximal

SUAs will not be combined into a SUA zone if VV is present. If visible vermiculite is not observed, proceed with sample collection of the SUA zone

Section 5
Sample Collection

Don the appropriate PPE as specified in the governing HASP. A new pair of disposable gloves is to be worn for each sample collected. Segregate land use areas on the property into zones as described in Section 4. To reduce dust generation during sampling, use a sprayer with DI water to wet each sub-sample location prior to collection. Use the trowel to check beneath the surface soil layer, but do not advance more than 6 inches. If VV is observed, record the information on the field sketch or design drawing. If VV is observed within a large SUA, do not collect a sample from the area containing VV as described above.

Within each zone, select 30 sub-sample locations equidistant from each other. These 30 sub-sample locations will comprise the 30-point composite sample for that zone. All composite sub-samples will originate from the same land use area. For example, do not mix sub-samples from SUAs with sub-samples from LUAs.

Clean the sub-sample locations of twigs, leaves, and other vegetative material that can be easily removed by hand. Using the trowel or push probe, excavate a hole in the soil approximately 2 inches in diameter and 6 inches deep for SUAs, or 3 inches deep for non-SUAs, while placing the excavated material directly inside the gallon-sized zip-top plastic bag. Repeat this step for each subsequent sub-sample until the appropriate number of composite sub-samples has been collected. As each sub-sample is collected, inspect the location for VV as prescribed in the SOP for Semi-Quantitative Visual Estimation of Vermiculite in Soil, Revision 1 (CDM 2007a).

Samples collected from zones measuring greater than 3,000 ft^2 will require additional PIs to inspect the soil for VV, but no more than 30 sub-samples will be collected from a zone for each composite sample. Samples collected from zones measuring less than 3,000 ft^2 will have the same number of sub-samples as PIs unless additional PIs are required to identify the extent of localized VV.

Homogenize the sample as required by governing guidance documents. Once the sample is homogenized, fill the zip-top plastic bag to 1/3rd full (approximately 2000 grams). Affix the sample index ID label to the inside of the bag and write the index ID number on the outside of the bag, or affix an additional label using clear packing tape. Sample index ID numbers will be assigned based on the investigation-specific guidance document. Double bag the sample and repeat the labeling process for the outer bag. Decontaminate equipment between composite samples as described in Section 8.

Repeat steps outlined above until all samples from a property have been collected.

Soil field duplicate samples will be collected at the rate specified in governing guidance documents. Field duplicate samples will be collected as samples co-located in the same zone. The duplicate will be collected from the same number of sub-samples as the parent sample, but the sub-sample locations of the duplicate sample will be randomly located in the zone. The inspection for VV at each sub-sample location will follow the same protocol as referenced above. These samples will be independently collected with separate sampling equipment or with the original sampling equipment after it has been properly decontaminated. For tracking purposes, the parent/duplicate sample relationship will be recorded in accordance with sample documentation requirements stated in the governing guidance document. These samples will be used to determine the variability of sample results in a given land use area. These samples will not be used to determine variability in sampling techniques.

Section 6
Site Cleanup

IDW will be managed as prescribed in Section 3.2.10 of the Site-wide QAPP [SWQAPP] (CDM 2007b) or other applicable governing guidance documents. In general, replace the soil plug with excess sample volume. The soil should be placed back into the hole and tamped down lightly. If sandy areas such as playgrounds are sampled, refilling the soil plug is not necessary.

Rinse water, the roots of vegetation removed during sampling, and any excess soil volume may be returned to the sampled area.

Section 7
Documentation

A field logbook/PDA will be maintained by each individual or team that is collecting samples as prescribed in Section 3.2.4 of the SWQAPP (CDM 2007b) or other applicable governing guidance documents. Guidance documents will detail conditions which require attention, but at a minimum the following information should be collected:

- Project name
- Title of governing documents
- Property address
- Date
- Time
- Team members

- Weather conditions
- PPE used
- Locations of any samples or sub-samples that could not be acquired
- Descriptions of any deviations to the SAP or SOP and the reason for the deviation
- Relinquishment of samples to project sample coordinator

Complete required documentation as detailed in applicable governing guidance documents.

Section 8
Quality Assurance/Quality Control

Quality control samples will include:

- Field duplicates

Detailed information on QC sample collection and frequency is prescribed in Section 3.1.3.2 of the SWQAPP (CDM 2007b) or other applicable governing guidance documents.

Section 8
Decontamination

All sampling equipment must be decontaminated prior to reuse. Specific instructions on sample equipment decontamination are included in the applicable governing guidance documents. In general, the procedure to decontaminate all soil sampling equipment is outlined below:

- Remove all visible contamination with plastic brush
- Use DI water and plastic brush to wash each piece of equipment
- Remove excess water present on the equipment by shaking
- Use a paper towel to dry each piece of equipment
- Wrap dried equipment in aluminum foil

Once a week all soil sampling equipment will be cleaning using Alconox and DI water.

Spent wipes, gloves, aluminum foil, and PPE must be disposed of or stored properly as IDW, specified in Section 3.2.10 of the SWQAPP (CDM 2007b) or other applicable governing guidance documents.

Section 9
Sample Custody

Field sample custody and documentation will follow the requirements described in Section 3.2.11 of the SWQAPP (CDM 2007b) or other applicable governing guidance documents.

Section 10
Glossary

Governing guidance documents - The written document that spells out the detailed site-specific procedures to be followed by the project leader and the field personnel for completing specific investigations. These documents will clearly indicate specific requirements for the implementation of this SOP.

Libby Superfund Site – The Libby Superfund Site contains all buildings and land within the boundaries of each operable unit (OU) of the site and illustrated on the most recent version of the OU boundary map.

Sub-sample - The actual location at which the sample is taken. The dimension of a sample point is 2 inches across by 3 inches deep (6 inches for SUAs).

Composite Sampling - A sample program in which multiple sample points are compiled together and submitted for analysis as a single sample.

Land Use Area - A section of property segregated by how the property owner uses the area. The area can be classified as a SUA, LUA, CUA, ISA, or NUA.

Section 11
References

CDM. 2007a. Semi-Quantitative Visual Estimation of Vermiculite in Soils at Residential and Commercial Properties, Revision 1. CDM-LIBBY-06.

CDM. 2007b. Site-Wide Quality Assurance Project Plan. Draft in review.

Site-Specific Sampling Guidance
Libby Superfund Site

SOP No.: CDM-LIBBY-06, Revision 1

SOP Title: Semi-Quantitative Visual Estimation of Vermiculite in Soils at Residential and Commercial Properties

Approved by:

Technical Reviewer — Date: 5/10/07

QA Reviewer — Date: 5/10/07

Volpe Center Approval — Date: 05/10/07

EPA Approval — Date: 5/10/07

Section 1
Purpose

EPA will identify and delineate the extent of any visible vermiculite (VV) present in soils as part of all investigations conducted at the Libby Superfund Site and specified in governing guidance documents. The goal of this standard operating procedure (SOP) is to provide a consistent approach to identify and characterize any VV present in soils.

The semi-quantitative approach presented in this SOP for visually estimating VV in soil will be revised as required to optimize data collection as the sampling teams gain experience. This will be accomplished by expanding and/or improving this SOP, supporting pictorial standards, and additional electronic data acquisition efforts, as necessary.

Section 2
Definitions

Specific Use Area (SUA) – Discrete exterior parcels on a property with a designated specific use. Due to the nature of activities typically carried out in SUAs, residents may be especially vulnerable to exposures when Libby amphibole asbestos (LA) contaminated soil becomes airborne. SUAs may be bare or covered with varying amounts of vegetation. SUAs include:

- Flower Pot
- Flowerbed
- Garden
- Stockpile
- Play Area
- Dog Pen
- Driveway (non-paved)
- Parking Lot (non-paved)
- Road (non-paved)
- Alley (non-paved)

Common Use Area (CUA) – Exterior parcels on a property with varied or generic use. CUAs may be bare or covered with varying amounts of vegetation. CUAs include:

- Walkway
- Yard (front, back, side, etc.)
- Former Garden
- Former Flowerbed

Limited Use Area (LUA) – Exterior parcels on a property that are accessed, utilized, and maintained on a very limited basis. LUAs may be bare or covered with varying amounts of vegetation. LUAs include:

- Pasture
- Maintained/Mowed Fields
- Underneath porches/decks[1]
- Overgrown Areas (with trails/footpaths, or between SUAs/CUAs)

Interior Surface Area (ISA) – Interior soil surfaces of buildings such as garages, pumphouses, sheds, and crawlspaces.

Non-Use Area (NUA) – Exterior parcels on a property with no current use (e.g., areas that are un-maintained and not accessed). NUAs may be bare or covered with varying amounts of vegetation. NUAs include:

- Wooded Lots
- Un-maintained Fields

Since NUAs are not currently accessed, they are not presently considered a complete exposure pathway. As such, semi-quantitative visual estimates of vermiculite in soil will not be captured at this time. However, to the extent that NUAs may become a complete exposure pathway in the future, EPA may revisit these NUAs at a later date.

Zone[2] – Parcels on a property that share a similar land use or subdivisions of a land use area based on site conditions (e.g., access, construction setup considerations, etc.) or sampling requirements. No area type may be combined with any other area type. For example, driveways and flowerbeds are both SUAs but will be separated into unique zones for visual inspection. Similarly, large CUAs such as yards may be subdivided into front yard, side yard, and back yard zones dependent on site conditions. Sectioning properties into additional zones will be at the discretion of the field team leader but consistent among the teams.

It is anticipated that SUAs and ISA zones will generally tend to be smaller parcels. Combining small, proximal SUAs into one zone will be at the discretion of the field team leader but consistent among teams. No ISA will be combined with any other ISA for visual inspection. There is not a maximum square footage restriction on any zone.

[1] The soils underneath porches and decks will be classified as LUAs depending on ground clearance and accessibility to homeowners and pets. If these areas are not accessible, they will be classified as NUAs.
[2] The restriction on the maximum square footage of SUA zones (1,000 ft2) and non-SUA zones (2, 500 ft2) was eliminated from the previous iteration of this SOP after the data were reviewed by EPA and determined to sufficiently characterize the presence of VV regardless of zone square footage. Additionally, this will allow the flexibility necessary for field teams to identify areas of zones most cost effectively for removal purposes.

Point Inspection (PI) – Used in SUA, CUA, LUA, and ISA zones. A PI is an intrusive visual inspection of the top portions of the soil at a randomly selected point within a zone. A PI consists of the active displacement of the surface soil with a small shovel and visual inspection of the displaced soil to determine if VV is present. If VV is observed during the PI, the location and a semi-quantitative estimate of VV contamination will be recorded.

Section 3
Applicability

This SOP applies to properties within the Libby Superfund Site at varying stages of the removal process including, but not limited to, all screening and risk-based investigations, pre-design inspections, and removal actions. Investigation-specific modifications to this SOP are outlined in the governing guidance document for each investigation. The following locations on a property will be evaluated for the presence/absence of VV:

- All parcels on a property where soil samples are being collected.
- All parcels on a property where soil was non-detect for LA during previous sampling activities.
- All SUA parcels on a property that have not been previously characterized as containing VV

Section 4
Procedure

Figure 1 illustrates the procedures and decision rules for this SOP. The three primary procedural steps are listed below:

- Establish zones
- Perform PI
- Perform semi-quantification of visual vermiculite

Each is described in the following subsections.

4.1 Establish Zones

Upon arrival at the property, the field team will locate all areas requiring sample collection (i.e., where previous soil sample results were non-detect for LA or SUAs have not been previously characterized for VV). Parcels will be identified as SUA zones, CUA zones, LUA zones, NUA zones, or ISA zones. The field team will measure the zone sizes and note them on the field sketch and/or design drawings. Zones will be assigned according to the definitions provided above.

4.2 Point Inspections[3]

As defined above, a PI is an intrusive visual inspection performed for the entire surface of a zone. Professional judgment may be used to determine the exact location of PIs; however, the following guidelines will be implemented to maintain consistency.

A minimum of 30 PIs will be evaluated per zone if sampling is required within that zone. If soil sampling is not required, a minimum of 5 PIs will be evaluated within each zone. Zones larger than 500 square feet (ft^2) will require evaluation at a minimum of 1 PI per 100 ft^2 (10 ft by 10 ft area). The PI locations will be randomly selected and will be spatially representative of the entire zone. Locations of the PIs and semi-quantitative estimates of VV (i.e., low, intermediate, or high) will be recorded on the field sketch for each PI. While a minimum of 5 PIs will be conducted per zone, there is no set maximum. Rather, the maximum number of PIs is variable—dependent upon the total area of the zone and achieving the minimum required frequency of 1 PI per 100 ft^2.

The following sections outline procedures for inspecting each use area (e.g., SUA, CUA, LUA, ISA). The procedure for semi-quantification of VV is provided in the next section.

<u>SUA Zone:</u>

- Visually inspect the PI point using a spade or trowel to remove any cover material, including excess debris (e.g., mulch, rock, etc.) and organic material, from the surface of the soil. Remove and visually inspect soil to a depth of 0-6 inches below ground surface[4].
- If a depth of 6 in. cannot be attained given the varying levels of compaction in driveways, roads, etc. the maximum depth attainable will be documented in the field logbook.
- Record semi-quantitative estimate of VV observed as described in the following section.
- Replace soil and cover material.
- Repeat as necessary employing procedure outlined above.

<u>CUA and LUA Zones:</u>

- Visually inspect the PI point using a spade or trowel, carefully removing organic material, including grass, from the surface of the soil. Remove and visually inspect soil to a depth of 0 - 3 inches below ground surface[5].

[3] Surface Inspections- The non-intrusive visual inspection of the immediate surface of a zone was eliminated from the previous iteration of this SOP after their data were reviewed and determined by EPA to provide no additional information over that gained through Point Inspections.
[4] A soil depth of 6 inches for SUAs was chosen to approximate the depths to which digging would be expected during typical activities occurring in these SUA zones (e.g., gardening, child digging in dirt, etc.)
[5] A soil depth of 0-3 inches was chosen to approximate the depths to which soil disturbance would be most likely during typical activities occurring in these CUA and LUA zones (e.g., lawn mowing, etc.)

- Record semi-quantitative estimate of VV observed as described in the following section.
- Carefully replace all soil and organic material.
- Repeat as necessary employing procedure outlined above.

ISA Zone:

- Move items as necessary to access the soil surface.
- Visually inspect the PI points using a spade or trowel, remove and visually inspect soil to a depth of 0 - 3 inches below ground surface[6].
- Record semi-quantitative estimate of VV observed as described in the following section.
- Repeat as necessary employing procedure outlined above.

If during the PI, VV is observed to be localized within a zone, the portion with vermiculite will be denoted on the field sketch. If additional PIs are necessary to determine the boundaries of the area, approximately 10 to 20% additional PIs will be evaluated to determine the extent of localized vermiculite.

4.3 Semi-Quantification of Visual Vermiculite

During PI, the field team will estimate the quantity of vermiculite observed. Each PI location for all zones will be assigned a semi-quantitative estimate of visible vermiculite content using a 4-point scale: none (blank), low (L), intermediate (M), and high (H)[7]. For PI locations where VV is observed, semi-quantitative estimates (e.g., L, M, or H) will be recorded on the field sketch. PI locations where VV is not observed will not be recorded on the field sketch. Photographs illustrating these quantities are attached to this SOP as Figure 2. Additionally, jars of vermiculite-containing soils representing these three levels will be available for training and reference.

Under the current version of this SOP, there will be no effort to design an approach to combine vermiculite levels for PIs within or among zones. While the viability of combining semi-quantitative visual estimates within or among zones may be assessed as a pilot-scale evaluation, any PI with visible vermiculite qualifies as vermiculite-containing soil for the area represented by the inspection point or inspection zone.

[6] A soil depth of 0-3 inches was chosen to approximate the depths to which soil disturbance would be most likely during typical activities occurring in these IS zones (e.g., entering crawlspace, retrieving items from shed, etc.)

[7] Based on EPA's review of previous data, the 5-level scale VV identification scheme was not meaningful and will be reduced to a 4-level scale. As such the quantity of "Gross" VV in the previous iteration of this SOP was combined with High. Previously collected data of Gross VV should be considered analogous to High VV under this revised SOP.

Section 5
Health & Safety/Engineering Controls

All personnel will carry out visual inspections in accord with proper personal protective equipment (PPE) and other monitoring/governing requirements outlined in the most recent version of the Site Health and Safety Plan governing the work being conducted.

All visual inspections will employ appropriate engineering controls to minimize dust (e.g., wetting soil during inspection) as prescribed in the Site-Specific Standard Operating Procedure for Soil Sample Collection (CDM-LIBBY-05, Revision 2).

Section 6
Equipment Decontamination

Equipment decontamination is not required between each PI from the same zone, but is required before moving to another inspection zone. Decontamination of equipment will be conducted as required by the governing guidance documents.

Section 7
Documentation

As noted above, information about the presence of vermiculite will be recorded on the field sketch or design drawing for the property under investigation. Each zone will be marked with:

- Zone type (i.e., SUA, CUA, LUA, NUA, or ISA)
- Zone area in ft^2
- PI locations/points
- Semi-quantitative estimate of VV content for each PI (i.e., L, M, H)

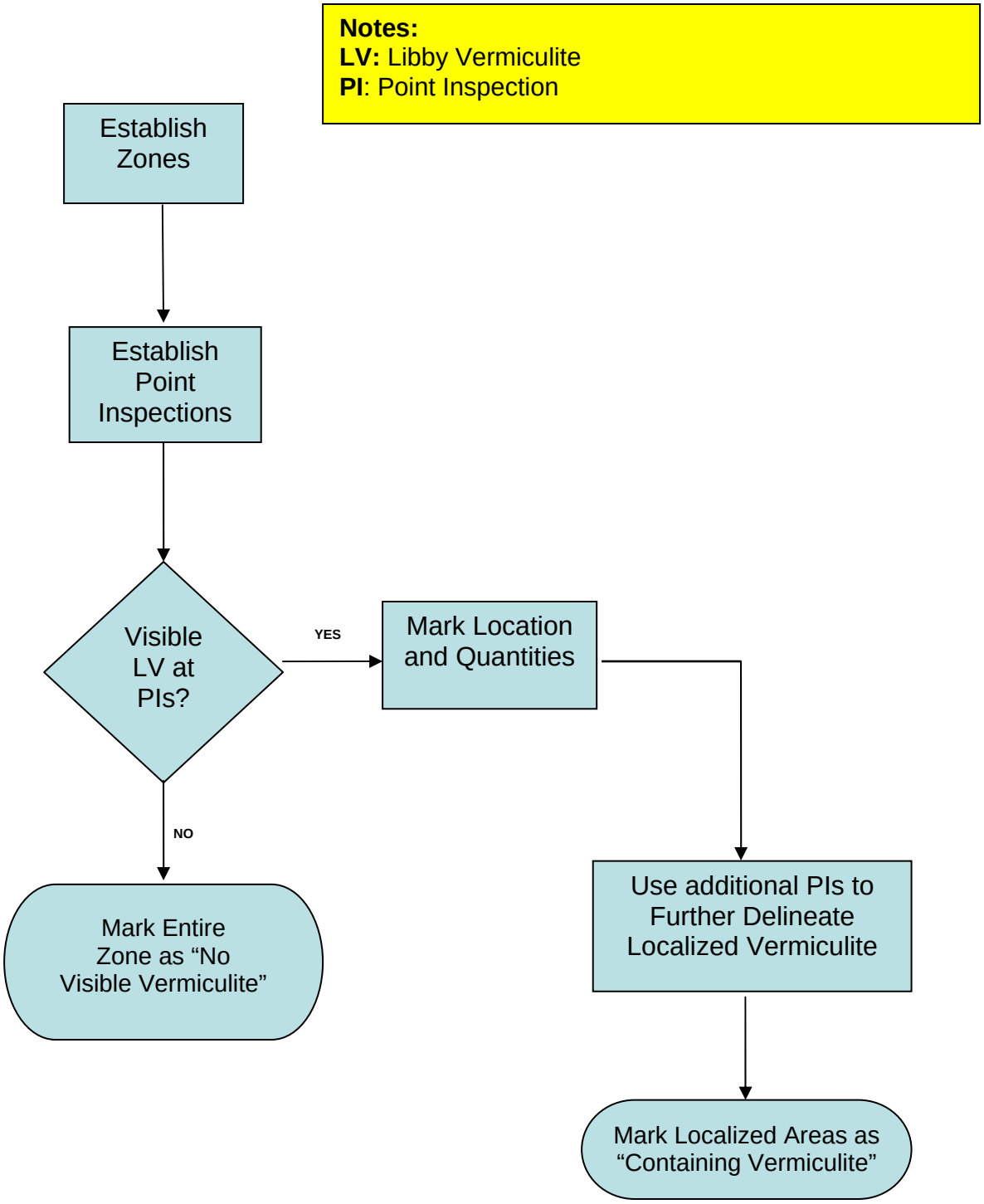
In addition to field sketch/design drawing documentation, each field team will generate a Visual Vermiculite Estimation Form (VVEF) (Figure 3) to document the semi-quantitative visual estimates of VV for each PI for possible future information use. This form will be managed according to governing guidance documents.

Section 8
Training

Every effort will be made to ensure consistency in the semi-quantitative evaluation of VV in soil to the extent possible. This will include training (e.g., field calibration), specimen examples (i.e., jars/photographs of low, intermediate, and high quantities of vermiculite, etc.), designated field staff, and oversight by the field team leader. Figures illustrating none, low, intermediate, and high quantities of vermiculite are attached to this SOP for reference (Figure 2).

To ensure consistency over time, the field team leader will verify semi-quantitative assignments at a rate of one property per team per week. The field team leader will sign off on those field sketches that were verified. If inconsistencies are noted, the field team leader will hold re-training with all teams participating simultaneously. Updates to the SOP and its attached specimen examples will occur as necessary and the EPA Project Team Leader and Technical Assistance Unit will be notified when these updates are recommended by the field team leader or field investigation manager.

Figure 1 – Visible Vermiculite Inspection Process



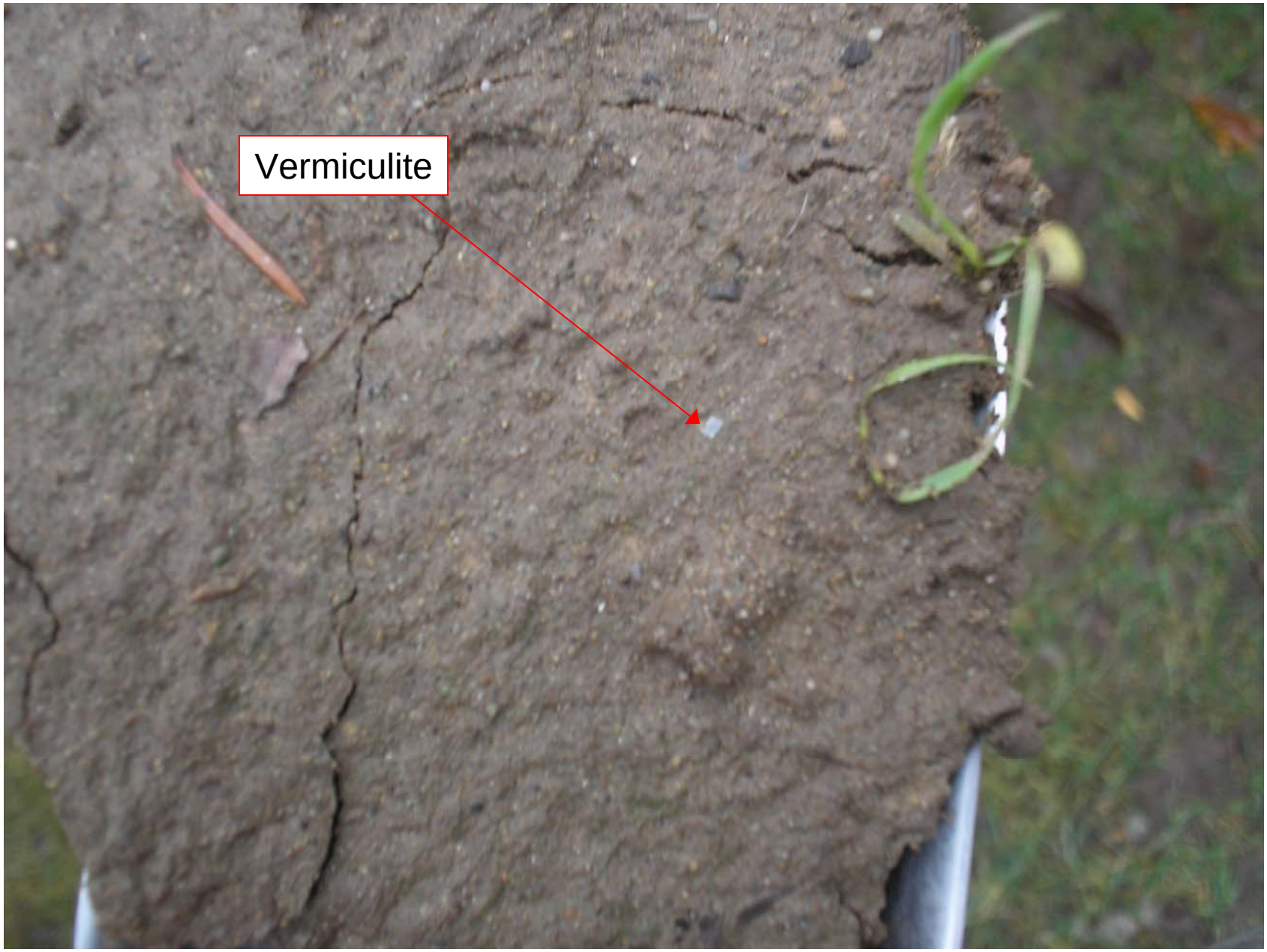


Figure 2a: Low Visible Vermiculite – A maximum of a few flakes of vermiculite observed within a given visual inspection point

Figure 2b: Intermediate Visible Vermiculite – Vermiculite easily observed throughout visual inspection point, including the surface.

Figure 2c: Intermediate Visible Vermiculite – Vermiculite easily observed throughout visual inspection point, including the surface.

Figure 2d: High Visible Vermiculite – Vermiculite easily observed throughout visual inspection point, including the surface.

LIBBY SUPERFUND SITE
Visual Vermiculite Estimation Form (VVEF)

Field Logbook No.: _____ Page No.: _____ Site Visit Date: _____ BD Number: _____

Address: _____ Structure Description: Property

Occupant: _____ Phone No.: _____

Owner (If different than occupant): _____ Phone No.: _____

Investigation Team: _____ Investigation Name: _____

Field Form Check Completed by (100% of Forms): _____ Visual Verification by Field Team Leader (10% of forms): _____

		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8
Type (SUA/CUA/LUA/IS)									
Description									
Area Size (square feet)									
General Comment (Cover, etc.)									
PIs (X=None, L=Low, M=Intermediate, H=High)	**X**								
	L								
	M								
	H								
	Total	0	0	0	0	0	0	0	0

Areas previously identified for removal not inspected for visible vermiculite? **Yes** **No** **NA** **Location(s):** _____

Project-Specific Standard Operating Procedure
Libby Asbestos Project

SOP No.: CDM-LIBBY-09, Revision 2
SOP Title: Global Positioning Satellite (GPS) Coordinate Collection and File Transfer Process
Project: Libby Asbestos Project
Project No.: 2616
Client: U.S. Department of Transportation (DOT)/Volpe Center

Authored by:

Diane M Rode

Date: 7/20/09

Diane Rode
CDM Libby IMS Support

Approved by:

Date: 7/27/09

Thomas E. Cook
CDM Technical Reviewer

Date: 7/27/09

Terry Crowell
CDM Quality Assurance Reviewer

1.0 Objective

The objective of this standard operating procedure (SOP) is to provide a standardized approach for the collection and handling of GPS data at the Libby Asbestos Site (site).

2.0 Background

2.1 Definitions

LibbySampling_090615.ddf Data Dictionary – All Trimble handheld units used at the site are pre-programmed with the LibbySampling data dictionary, specific to the spatial data collection needs for the Libby Asbestos Project. All personnel required to collect GPS data will be familiar with the contents of the LibbySampling data dictionary, which contains the following features: Sample, Building Location, Interest Point, and Interest Area. The Trimble units also are loaded with a generic data dictionary that handles collection of generic lines, points, and areas.

2.2 Discussion

The following attributes are required to be collected, as indicated in Table 1, for each feature type when a GPS coordinate is collected:

Table 1 – Attributes Collected in the LibbySampling_090615 Data Dictionary

Feature	Attributes Collected
Sample	IndexID, LocationID, Comment
Building Location	LocationID, Address, Comment
Interest Point	Location, Land_Use, Comment
Interest Area	Location, Land_Use, Comment

These attributes are discussed in detail in Section 4 of this document.

3.0 Responsibilities

GPS data is collected by field staff as specified in the guidance document (e.g., sampling and analysis plan) governing the field work. Transfer of GPS data from the field equipment to the onsite server and transmittal of data off-site will be performed by designated administrative support staff. Documentation regarding off-site processing is posted on the Libby eRoom at https://team.cdm.com/eRoom/R8-RAC/Libby/0_290a.

4.0 Procedures

The following sections describe how GPS points are collected and handled for features commonly used at the site.

4.1 GPS Point Collection

The Sample Feature from the LibbySampling data dictionary is used to collect GPS points for sample locations.

Soil Samples
For **Grab** samples, a GPS point is collected at the exact sampling location. Location IDs beginning with the prefix "SP" (indicating a sample point), are used for such locations.

For **Composite** samples, a GPS point is collected at the approximate center of each sample area. In the case of an irregular-shaped sample area or sample area that is non-continuous (e.g., a flowerbed that wraps around a house), a GPS point is collected at the center of the largest continuous sample area. Location IDs beginning with the prefix "SP" are used for such locations.

Outdoor Stationary Air and Dustfall (Settled Dust) Samples
For permanent (i.e., samples representing a consistent monitoring zone or area collected on a routine schedule) outdoor stationary air and dustfall sample locations, a GPS point is collected at each unique sample location. All subsequent samples taken at that location will be assigned the same Location ID and X,Y coordinates. The GPS point is only collected once. Location IDs beginning with the prefix "SP" (indicating a sample point), are used for such locations.

GPS points are **not** collected for the following features, unless otherwise specified in the governing document:

- Stationary air, dust, and soil samples collected inside or beneath 4-sided structures (locations are associated with the X,Y coordinate of the building where the sample was collected)
- Stationary air samples, with the exception of permanent monitoring locations as designated in site-specific removal work plans or Response Action Work Plan Addenda
- Duplicate or Replicate air or dust samples (which are assigned the same Location ID and X,Y coordinates as the parent sample)
- Soil samples taken at depth from the same sample area as a previously-collected sample. The at-depth soil sample will be assigned the same Location ID as the shallower sample in order to relate both samples to the same X,Y coordinate.
- Duplicate or split soil samples (which are assigned the same Location ID and X,Y coordinates as the parent sample)
- Personal air samples (locations are associated with the X,Y coordinate of the building (i.e., BD Location ID) or property (i.e., AD Location ID) where the sample was collected)

Building Locations
The Building Location Feature from the LibbySampling data dictionary is used to collect GPS points for building locations. For building locations, a GPS point is collected near the front door or main entrance of the building. Location IDs beginning with the prefix "BD" (indicating a building point), are used for such locations.

Interest Point, Interest Area
GPS points for these features are not routinely collected on the Libby Asbestos Project. However, they are included in the LibbySampling data dictionary in the event that a GPS point is collected for an area where no sampling is conducted, or a series of points is collected to document the perimeter of an interest area or sample area.

Pre-determined Sample Areas
For pre-determined sample areas (e.g., gridded) where waypoints are available, the Trimble units may be pre-loaded with waypoint files to guide samplers to sampling locations. Pre-loading of coordinates is typically performed by a member of the Libby information management system team or by the field team leader. It should be noted that, in order to ensure GPS coordinate data are included in the project database, *GPS points will also be collected at the time of sampling for sample locations located using waypoint files*.

4.2 Operation of Trimble Handheld Units:

Operators must be standing at the sample location *before* the unit starts to collect positions. Once the unit has started collecting positions, the operator must remain standing at the sample location until the minimum required positions have been collected. A minimum of **30** positions will be collected for each GPS location. More positions will be required in circumstances where the position dilution of precision (PDOP) is greater than the default setting of 4.5.

Record-keeping Requirements:

Serial numbers of the Trimble datalogger, receiver, and antenna will be recorded in a field logbook. GPS filenames will be recorded in the logbook. Recording GPS filenames on field sample data sheets (FSDSs) is not required.

Upgrades to Trimble Equipment and Software

Trimble equipment and software is subject to change according to availability. The field team leader or designated administrative support staff is responsible for contacting the technical support of the vendor if there are any questions regarding setup, operation, or data transfer of models not covered below.

Data Collection Instructions for Trimble Pro XRS:

- Turn on the Trimble unit
- Select **Data Collection** from the main menu
- Select **Create New File** and press **Enter**. A generic default file name that begins with "*RO…*" followed by the date will appear.
- **Name the file** using the following naming convention: **T1A10209**, where **T1** refers to the specific Trimble unit being used, **A** refers to the first file of the day (**B** would be the second file of the day, and so on), and **10219** refers to the date (October 21, 2009). The file name is limited to 8 characters on some units; therefore, the date notation must be MMDDY.
- Make sure the data dictionary is set to **LibbySampling**.
- Press **Enter** to bring up the **Start feature** menu.
- Arrow to the feature to be collected (i.e., Sample or Building Location). Press **Enter**

- Press the **F1** key to pause the unit until data collection can begin. (Note that if the unit is not paused, data collection will begin immediately).
- Enter the **Index ID** and **Location ID** exactly as they appear on the printed labels assigned to the sample.

  Index IDs, and Location IDs must match field documentation.
  - Capitalize the ID prefixes where they are capitalized
  - Include dashes where they are present
  - Remove extra spaces

  Data entry errors will prevent the coordinate data from exporting and validating correctly. Enter the property address and/or other information in the **Comment**. If required by the governing document, enter any additional information such as Owner, Sample Grid, Sample Location, etc. in the **Comment** field.
- Press the F1 key to **resume** collecting positions. The unit will beep for every position it collects, and display the total number of positions in the lower right corner.
- After the counter has reached the desired number of positions (30 positions), press **Enter** and then **Enter** to confirm and save your data point.
- Repeat this process for every new sample location.

Data may be viewed and edited by pressing **F2** (**Review**) from the **Start feature** menu, using the directional pad to scroll through the locations and pressing **Enter** to view the sample information. If edits are made to the data, be sure to press **Enter.** To exit without changing the data press **Esc**. Press **F2 (New)** to return to the **Start feature** menu.

Additional handheld features:

- **Review feature –** allows for quick review/editing of keyed data
- **Repeat feature –** use of this feature is not advised because of the likelihood to miss an edit of the index or location id fields. Points that have not been edited correctly will be rejected as duplicates when they are uploaded.
- **Offset –** reduces the extra time associated with trying to capture GPS data under bridges, large trees, porches, facades and awnings, or while standing close to a building or other object that can deflect satellites signals from the GPS receiver.
- **Delete Feature –** allows for deleting a feature from a file if, for example, no positions were collected or the sample is voided. This will prevent having to rectify data later on.
- **Rename File –** allows for file name browsing/editing. This will prevent having to rectify data if done *before* the files are downloaded.
- **Delete File –** allows for deleting a file from the handheld when necessary. This will prevent having to rectify data if it is done *before* the files are downloaded.

Data Collection Instructions for Trimble GeoXT:

- Turn on the unit and using the stylus, select **GPS** from the lower right menu. This will open the Terra Sync software.
- Wait for the GPS status screen to recognize at least 4 satellites. Depending on location, this can take several minutes and must be complete or data will not successfully be collected. The connected satellite names will appear on the left side of the screen – highlighted to indicate a connection.

- Select **Data** from the upper left drop down menu. Use the file naming convention described above to create a file. Make sure the data dictionary is **LibbySampling**. Select **Create**.
- Confirm the antennae height by selecting **Ok**.
- Highlight the appropriate feature name and select **Create**. The unit will begin logging the point automatically. Enter the attribute data using the stylus and the keyboard icon located at the bottom of the touch screen. When recording is complete, select **Ok**, which saves the file and location information.
- To collect other points within the same feature file, select the **Options** menu then select **Repeat**.

4.3 GPS Data Transfer from Handheld Units to Libbysvr02

GPS File Transfer to Libbysvr02 from Trimble Pro XRS

- Turn on the Trimble Unit
- *The unit will try to connect to the GPS receiver* - press the **Esc** button
- Select **File Manager**
- Select **File Transfer** - *currently the data consists of .ssf files and is transferred to Libbysvr02\libbycommon\Data Management\Pfdata\Libby - the file is named with an 8 character identifier: T + TrimbleUnitNo + file number (A for first file collected that day) + MMDDY*
- Open Pathfinder Office
- Select **Utilities**
- Select **Data Transfer**
- Select **Add**
- Select **Datafile –** *Pathfinder will search for a connection to the Trimble Unit*
- Connect the cable from the computer to the Trimble Unit
- A list of files will appear when the connection is complete
- Select **Open**
- Select **Transfer All**
- When the download is complete, close the data transfer window **–** *if downloading files from several units, close and reopen this window between downloads*
- Delete files from the Trimble Unit **–** *all of the files will be listed – double check that all the files were transferred to libbysvr02 before deleting*

GPS File Transfer to Libbysvr02 from Trimble Pro GeoXT

The Trimble GeoXT connects to a PC through the charger unit using a USB cable *(type A to type B)*, and Microsoft Active Sync software. *(There are Active Sync connection settings to enable or disable once the device is connected to the PC. From the Active Sync menu, select Tools, select Options. These connect the Trimble to other Windows applications on the PC [e.g.; email, task managers, etc.]. The main reason to disable these settings at the Libby office is that the Trimble Units are shared and it does not make sense to activate them.)*

- Turn on the Trimble Unit
- Select **GPS** - from lower right corner *(This opens up the TerraSync GPS software.)*
- Select **Setup**
- Select **Options**
- Select **Disconnect from GPS**

- Select **Data**
- At the bottom of list, select **File Manager**
- Open Pathfinder
- Select **Utilities**
- Select **Data Transfer**
- From the Device list, select **GIS Datalogger on Windows CE**
- Click on the connect icon (the button with the checkmark circled in green). *A picture on the right will indicate the connection status.*

4.4 Transfer of GPS Data Off-site for Validation and Post-Processing

Following the download of files from the Trimble units, a copy of each file is made and filed in *Libbysvr02\ libbycommon\Data Management\Pfdata\Libby\RawFiles*. The raw files are not modified but kept as the only copy of the original downloaded data files. The files are zipped and sent off-site for validation and post-processing. The .zip files are moved to *Libbysvr02\libbycommon\Data Management\Pfdata\Libby\QC and sent zip files.*

For reference on using Pathfinder export and ARCMap attribute tables see e-Rroom: Libby GIS folder: GPS to GIS procedure posted by Mike Schultz on August 29, 2006.

4.5 Equipment, Software & Configuration

For Trimble Pro XRS or Trimble GeoXT:

Software used for data transfer: GPS Pathfinder Office 2.90 and 3.10
TerraSync

Software used for on-site QC: GPS Pathfinder Office 2.90 and 3.10
ArcGIS ArcMap
Microsoft Excel
eLASTIC

Configuration Settings (TSC1 5.27 software)
Software can vary with rental equipment. Some settings can be changed to accommodate data collection needs.

Table - 2 Configuration Settings for Trimble Pro XRS

GPS Rover Options - Logging Options		
Logging Intervals	Point feature	1 s
	Line / area	3 s
	Not in feature	none
	Velocity	none
Confirm end feature	no	
Minimum Positions	30	
Carrier phase	Carrier mode	off
	Minimum time	10mins
GPS Rover Options – Position Filters		
Position mode	Manual 3D	

Elevation mask	15 degrees	
SNR mask	6.0	
DOP type	PDOP	
PDOP mask	6.0	
PDOP switch	4.0	
GPS Rover Options – Real-time input		
Preferred correction source	use uncorrected GPS	
GPS Rover Options – General real-time settings		
Correction age limit	10s	
GPS Rover Options – Antenna options		
Height	6.000USft	
Measure	Vertical	
Confirm	Never	
Type	auto-filled when part number is entered	
Part number	get part number off of antenna	
GPS Rover Options – Initial Position		
North	USft	
East	USft	
GPS Rover Options – 2D altitude		
Altitude(MSL)	USft	
Computed at	time	
Computed at	date	
GPS Base Station Options – Logging Options		
Logging Intervals	Measurements	5s
	Positions	30s
Audible Click	Yes	
Log DOP data	Yes	
GPS Base Station Options – Position Filters		
Position mode	Manual 3D	
Elevation mask	15 degrees	
SNR mask	4.0	
PDOP mask	6.0	
PDOP switch	4.0	
GPS Base Station Options – Real-time output options		
Real-time output mode	off	
Radio type	Custom	
Baud rate	9600	
Data bits	8	
Stop bits	1	
Parity	Odd	
RTCM options	Station	1
	Message type	Type 1
	Message interval	5s
	Message suffix	None
	CTS flow control	Off
	CTS xmit delay	0ms
	RTS mode	High
	RTS edge delay	0ms
GPS Base Station Options – Reference position		
Datum	NAD 1983 (Conus)	
Zone	11 North	
NMEA/TSIP Output options		
Output	TSIP	
Baud rate	38400	
Coordinate System	UTM	

Map display options	All show with no background	
Units and Display		
Units	Distance(2D)	US Survey Ft
	Area	Square feet
	Velocity	Miles/Hour
	Angle format	DDMMSSss
	Order	North/East
	North reference	True
	Magnetic declination	Auto
	Null string	
	Language	English
Time and Date	24 hour clock	Yes
	Time	##:##:##
	Date format	MM/DD/YYYY
	Date	MM/DD/YY weekday
Quickmarks	Attributes	Repeat
	Confirm	No
Hardware(TSC1) software version 5.27		

Table 3 LibbySampling_090615 Data Dictionary
"LibbySampling_090615", Dictionary
"Sample", point, "", 1, seconds, 1, Code
"IndexID", text, 30, required, required, Label2
"LocationID", text, 30, required, required, SP-, Label1
"Comment", text, 30, normal, normal
"Building Location", point, "", 1, seconds, 1, Code
"LocationID", text, 30, required, required, BD-, Label1
"Address", text, 50, required, normal, Label2
"Comment", text, 30, normal, normal
"Interest Point", point, "", 1, seconds, 1, Code
"Location", text, 30, required, required, Label1
"Land_Use", text, 30, required, required, Label2
"Comment", text, 30, normal, normal
"Interest Area", area, "", 3, seconds, Code
"Location", text, 30, required, required, Label1
"Land_Use", text, 30, required, required, Label2
"Comment", text, 30, normal, normal